

[7590-01-P]

NUCLEAR REGULATORY COMMISSION

10 CFR Part 40

RIN: 3150-AI40

[NRC-2008-0421]

Ground Water Protection at Uranium *In Situ* Recovery Facilities

AGENCY: Nuclear Regulatory Commission.

ACTION: Request for comment.

SUMMARY: The U.S. Nuclear Regulatory Commission (NRC) is requesting views from interested stakeholders on whether the NRC should resume rulemaking to amend its regulations governing the domestic licensing of source material by codifying general requirements to address ground water protection at uranium *in situ* recovery (ISR) facilities. The NRC currently regulates ISR operations through application of regulations that primarily focus on conventional uranium mills and site-specific license conditions. The NRC initiated rulemaking in 2006 to develop requirements to provide regulatory consistency and improve the efficiency of the ISR licensing process but placed this rulemaking on hold in 2010. Information provided to the NRC during the public comment period will be factored into the decision as to whether the NRC will continue this rulemaking.

DATES: Submit comments by **[INSERT DATE 30 DAYS AFTER DATE OF PUBLICATION IN THE *FEDERAL REGISTER*]**. Comments received after this date will be considered if it is practical to do so, but the NRC is able to ensure consideration only for comments received on or before this date. The NRC will not prepare written responses to each individual comment but will consider each in determining the path forward for this rulemaking.

ADDRESSES: You may submit comments by any of the following methods:

- **Federal Rulemaking Web Site:** Go to <http://www.regulations.gov> and search for Docket ID **NRC-2008-0421**. Address questions about NRC dockets to Carol Gallagher; telephone: 301-415-3463; e-mail: Carol.Gallagher@nrc.gov. For technical questions contact the individuals listed in the FOR FURTHER INFORMATION CONTACT section of this document.

- **E-mail comments to:** Rulemaking.Comments@nrc.gov. If you do not receive an automatic e-mail reply confirming receipt, then contact us at 301-415-1677.

- **Fax comments to:** Secretary, U.S. Nuclear Regulatory Commission at 301-415-1101.

- **Mail comments to:** Secretary, U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001, ATTN: Rulemakings and Adjudications Staff.

- **Hand deliver comments to:** 11555 Rockville Pike, Rockville, Maryland 20852, between 7:30 a.m. and 4:15 p.m. (Eastern Time) Federal workdays; telephone: 301-415-1677.

For additional direction on obtaining information and submitting comments, see “Obtaining Information and Submitting Comments” in the SUPPLEMENTARY INFORMATION section of this document.

FOR FURTHER INFORMATION CONTACT: Andrew G. Carrera, telephone: 301-415-1078; e-mail: Andrew.Carrera@nrc.gov; or Gary Comfort, telephone: 301-415-8106; e-mail: Gary.Comfort@nrc.gov. Both are staff of the Office of Nuclear Material Safety and Safeguards, U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001.

SUPPLEMENTARY INFORMATION:

I. Obtaining Information and Submitting Comments

A. Obtaining Information

Please refer to Docket ID **NRC-2008-0421** when contacting the NRC about the availability of information for this action. You may obtain publicly-available information related to this action by any of the following methods:

- **Federal Rulemaking Web Site:** Go to <http://www.regulations.gov> and search for Docket ID **NRC-2008-0421**.

- **NRC's Agencywide Documents Access and Management System (ADAMS):** You may obtain publicly-available documents online in the ADAMS Public Documents collection at <http://www.nrc.gov/reading-rm/adams.html>. To begin the search, select "[Begin Web-based ADAMS Search](#)." For problems with ADAMS, please contact the NRC's Public Document Room (PDR) reference staff at 1-800-397-4209, 301-415-4737, or by e-mail to pdr.resource@nrc.gov. For the convenience of the reader, instructions about obtaining materials referenced in this document are provided in the "Availability of Documents" section.

- **NRC's PDR:** You may examine and purchase copies of public documents at the NRC's PDR, Room O1-F21, One White Flint North, 11555 Rockville Pike, Rockville, Maryland 20852.

B. Submitting Comments

Please include Docket ID **NRC-2008-0421** in your comment submission.

The NRC cautions you not to include identifying or contact information that you do not want to be publicly disclosed in your comment submission. The NRC will post all comment submissions at <http://www.regulations.gov> as well as enter the comment submissions into ADAMS. The NRC does not routinely edit comment submissions to remove identifying or contact information.

If you are requesting or aggregating comments from other persons for submission to the NRC, then you should inform those persons not to include identifying or contact information that they do not want to be publicly disclosed in their comment submission. Your request should state that the NRC does not routinely edit comment submissions to remove such information before making the comment submissions available to the public or entering the comment into ADAMS.

II. Background

In situ recovery is a method used to extract uranium from underground ore bodies without physical excavation. It is also known as “solution mining” or *in situ* leaching. In the ISR process, a solution called lixiviant is pumped into the subsurface. In the United States, lixiviant typically contains water mixed with oxygen and/or hydrogen peroxide, as well as sodium carbonate or carbon dioxide. The lixiviant dissolves the uranium, located in the underground ore body, into the solution. The solution is then pumped to the surface, where it undergoes additional processing and concentration to produce a solid form of uranium called “yellowcake.” The yellowcake is ultimately used in the manufacture of fuel for nuclear reactors.

The licensed area of a typical uranium ISR facility covers several square miles and may include several discrete or contiguous wellfields, some of which may be operating while others may be in restoration or decommissioning. Each ISR wellfield is composed of a series of injection and extraction wells drilled into a uranium ore body that has been identified in a subsurface geologic formation within the wellfield. The aquifer within the formation where the ore body is located is commonly referred to as the “ore zone aquifer”. Currently, there are six ISR facilities operating in the United States.

Uranium ISR was introduced in the late 1970s as an alternative to conventional uranium recovery, which involves extracting uranium ore from the earth, typically through deep underground shafts or shallow open pits. Ore extracted by conventional uranium

recovery is transported to a mill, where it is crushed and undergoes a chemical process to remove the uranium. The uranium is then concentrated to produce yellowcake. The sandy waste resulting from crushing the uranium ore is known as “uranium mill tailings” or “tailings.” Tailings contain heavy metals and radioactive constituents, such as radium. Alternatively, uranium may be recovered from the ore using a heap leach process. In the heap leach process, the ore is placed on an engineered barrier and sprayed with acid. The uranium dissolves into solution and is collected at the engineered barrier. The solution undergoes additional chemical processing to produce yellowcake. Currently, there is one operating conventional uranium mill and there are no operating heap leach facilities in the United States.

The NRC licenses ISR facilities under part 40 of title 10 of the *Code of Federal Regulations* (10 CFR), “Domestic Licensing of Source Material,” because these facilities possess and use source material.¹ The possession and use of source material are activities that require a license from the NRC under the Atomic Energy Act of 1954, as amended (AEA).² The waste (tailings) generated as a result of the ISR process falls within a category of byproduct material defined in section 11e.(2) of the AEA. Specifically, in section 11e.(2), byproduct material is defined as “the tailings or wastes produced by the extraction or concentration of uranium or thorium from any ore processed primarily for its source material content.”³

¹ The term “source material” is defined as “(1) Uranium or thorium, or any combination thereof, in any physical or chemical form or (2) ores which contain by weight one-twentieth of one percent (0.05%) or more of: (i) Uranium, (ii) thorium or (iii) any combination thereof.” 10 CFR 40.4, “Definitions”.

² AEA, § 62, 42 U.S.C. § 2092 (“Unless authorized by a general or specific license issued by the [Nuclear Regulatory] Commission ... no person may transfer or receive in interstate commerce, transfer, deliver, receive possession of or title to, or import into or export from the United States any source material after removal from its place of deposit in nature...”).

³ AEA, § 11e.(2); 42 U.S.C. § 2014(e)(2). In 10 CFR 40.4, the NRC further defines section 11e.(2) byproduct material as “the tailings or wastes produced by the extraction or concentration of uranium or thorium from any ore processed primarily for its source material content, including discrete surface wastes resulting from uranium solution extraction processes. Underground ore bodies depleted by such solution extraction operations do not constitute ‘byproduct material’ within this definition.”

Under the Uranium Mill Tailings Radiation Control Act of 1978 (UMTRCA) (Public Law 95-604), the NRC is responsible for regulating section 11e.(2) byproduct material at sites where such material is generated. Congress enacted UMTRCA to provide public health, safety, and environmental protection from the radiological and non-radiological hazards associated with the processing, possession, transfer, and disposal of AEA section 11e.(2) byproduct material. The UMTRCA amended the AEA by adding to it the section 11e.(2) definition of byproduct material and sections 84 and 275.

The AEA, as amended by UMTRCA, established a dual regulatory scheme over the domestic uranium milling industry between the U.S. Environmental Protection Agency (EPA) and the NRC. Under section 275b. of the AEA, the EPA is authorized to issue standards of general applicability for the protection of health, safety, and the environment from radiological and non-radiological hazards associated with the processing of section 11(e)(2) byproduct material.⁴ Under AEA section 84,⁵ the NRC or the appropriate Agreement State⁶ is responsible for implementing the EPA's generally applicable standards. In this regard, the NRC or the applicable Agreement State entity is the regulatory or licensing agency for all uranium recovery facilities, including ISR facilities, and is responsible for inspecting the facility and enforcing the terms and conditions of the operating license.⁷

The EPA first issued generally applicable standards on October 7, 1983 (48 FR 45926) and updated these standards on November 15, 1993 (58 FR 60340).

⁴ 42 U.S.C. § 2022(b).

⁵ 42 U.S.C. § 2114.

⁶ Section 274 of the AEA authorizes the NRC to relinquish or discontinue its regulatory authority over certain categories of radioactive material to a State following a duly executed agreement between the NRC and the governor of the State. 42 U.S.C. § 2021. After the agreement is entered into, the State, now an "Agreement State," must promulgate or adopt regulations compatible to those NRC regulations that govern the subject matter areas relinquished to the Agreement State.

⁷ AEA § 275b.(2); 42 U.S.C. § 2022(b)(2) ("no permit issued by the [EPA] Administrator is required under this Act or the [Resource Conservation and Recovery Act, 42 U.S.C. §§ 6901 *et seq.*] for the processing, possession, transfer, or disposal of [section 11e.(2)] byproduct material").

The EPA codified these standards into its regulations at 40 CFR part 192, “Health and Environmental Protection Standards for Uranium and Thorium Mill Tailings,” subpart D, “Standards for Management of Uranium Byproduct Materials Pursuant to Section 84 of the Atomic Energy Act of 1954, as amended.” The NRC issued its implementing regulations on October 16, 1985 (50 FR 41852) and further amended them in subsequent rulemakings.⁸ The NRC codified its implementing regulations at 10 CFR part 40, “Domestic Licensing of Source Material,” appendix A, “Criteria Relating to the Operation of Uranium Mills and the Disposition of Tailings or Wastes Produced by the Extraction or Concentration of Source Material from Ores Processed Primarily for their Source Material Content.”

In the 1990s, ISR operations became the predominant means of extracting uranium in the United States. In COMJSM-06-0001, “Regulation of Groundwater Protection at *In Situ* Leach Uranium Extraction Facilities,” dated January 17, 2006 (ADAMS Accession No. ML060830041), NRC Commissioner Merrifield stated:

[W]hile the staff has done its best to regulate [ISR] licensees through the generally applicable requirements in Part 40 and imposition of license conditions, our failure to promulgate specific regulations for [ISRs] has resulted in an inconsistent and ineffective regulatory program. We have been attempting to force a square peg into a round hole for years, and I believe we should finally remedy this situation through notice and comment rulemaking. In developing a proposed rule, the staff should formulate a

⁸ Substantive amendments include 52 FR 43553 (November 13, 1987) (NRC conforming amendments not covered in the October 16, 1985 rule); 53 FR 19240 (May 27, 1988) (record retention periods); 59 FR 28220 (June 1, 1994) (emplacement of final radon barrier on conventional mill tailings piles); and 76 FR 35512 (June 17, 2011) (financial assurance requirements associated with decommissioning planning).

regulatory framework that is tailored specifically to this
unique group of licensees.

In the Commission's subsequent staff requirements memorandum, dated March 23, 2006 (ADAMS Accession No. ML060820503), the Commission approved the initiation of a rulemaking for the purpose of providing clarity, predictability, and consistency to the licensing and regulation of ISR facilities.

In 2010, the EPA informed the NRC that it would undertake its own rulemaking effort to issue generally applicable standards for ISRs. The NRC then deferred its ongoing ISR rulemaking effort, prior to the publication of a proposed rule, in anticipation of the need to conform its implementing regulations to the generally applicable standards to be issued by the EPA. The EPA issued its proposed rule on January 26, 2015 (80 FR 4156). Subsequently, the EPA decided to re-propose the rule and seek additional public comment. The EPA issued the re-proposed rule, superseding the January 2015 proposed rule, on January 19, 2017 (82 FR 7400). The NRC had jurisdictional and technical concerns with both the January 2015 and January 2017 proposed rules and submitted comments addressing these concerns on July 18, 2017 (ADAMS Accession No. ML17173A638).

On October 30, 2018 (83 FR 54543), the EPA withdrew its proposed rule. The EPA concluded, based on comments from stakeholders, that it had serious questions concerning whether it has the legal authority under UMTRCA to issue the regulations as provided in the 2017 proposed rule. The EPA also concluded that the existing regulatory framework was sufficient to ensure the protection of public health and the environment at existing ISRs. Finally, the EPA stated that, given current and foreseeable market conditions, the uranium recovery industry was not likely to have the robust growth that was anticipated in the 2000s. Given the EPA's withdrawal of its proposed rule, the NRC

must now decide whether to proceed with its 2006 ISR-specific rulemaking, held in abeyance since 2010.

III. Discussion

The current version of appendix A to 10 CFR part 40 provides a generic set of regulations for the operation of conventional uranium mills. With respect to the NRC's licensing of ISR facilities, the current regulations in appendix A, coupled with the conditions of ISR site-specific licenses and the NRC's ongoing oversight of the licensees' operations, provide adequate protection to the public health and safety and the environment. The NRC's purpose in promulgating a generic set of regulations for the operation of ISRs is to standardize existing NRC ISR licensing and oversight practices and to ensure consistency in the NRC staff's evaluation and approval of ISR license applications. In addition, the promulgation of generic regulations for ISR facilities would provide a national regulatory framework from which Agreement States can, in turn, promulgate their own compatible regulatory standards. If the NRC continues with this rulemaking, the amendments to appendix A would be based upon many of the license conditions that are contained in current NRC-issued site-specific ISR licenses and would be further informed by the approved methodologies and best practices set forth in those NRC guidance documents that are applicable to ISR activities.

ISR operations are substantially different from those of conventional uranium milling, including the measures taken to ensure the protection of groundwater. The requirements for groundwater protection at conventional uranium mills are mainly concerned with the prevention, detection, and correction of contamination in shallow aquifers from seepage and leaks associated with the long-term management of mill tailings impoundments. At ISR facilities, however, the main concern is contamination of the surrounding groundwater by the short-term degradation of the water quality in the ore zone aquifer during ISR operations. Specifically, the groundwater chemistry in the

ore zone aquifer is altered by the injection of lixiviant, which along with dissolving the uranium located in the underground ore body, also mobilizes hazardous constituents such as metals and radionuclides like radium. If the lixiviant is not controlled within the ore zone aquifer, then these hazardous constituents may migrate outside the ISR wellfield and potentially contaminate surrounding groundwater and connected surface water. Therefore, the NRC and the Agreement States have included license conditions in ISR licenses requiring ISR licensees to satisfy certain technical criteria that will protect surrounding groundwater during ISR operations and restore the water quality in ore zone aquifers after ISR operations. Unlike conventional mill tailings impoundments that require long-term management for groundwater protection, ISR wellfields may be decommissioned and the ISR license terminated once groundwater restoration requirements are met.

The NRC initiated the ISR rulemaking in 2006 to provide regulatory predictability and consistency to the licensing process for ISRs. By establishing a generic set of requirements for ISR activities, the rule would improve regulatory efficiency and make the NRC's review process for ISR license applications and amendments more consistent and transparent to the public and industry.

Most ISR facilities currently in operation are licensed by Agreement States. One of the requirements of the NRC's Agreement State program is that the regulations of an Agreement State must be "compatible" with the NRC's regulatory program.⁹ Therefore, in accordance with the NRC's Agreement State program, the promulgation of an NRC rulemaking specific to ISR facilities would require Agreement States to conform their

⁹ Agreement State Program Policy Statement, 82 FR 48535-39 (October 18, 2017); *see also id.* at 48536-37 ("The NRC and the Agreement States have the responsibility to ensure that the radiation control programs are compatible. Such radiation control programs should be based on a common regulatory philosophy including the common use of definitions and standards. The programs should be effective and cooperatively implemented by the NRC and the Agreement States and also should provide uniformity and achieve common strategic outcomes in program areas of national significance.").

regulations, to the extent appropriate, to the new or amended NRC regulations. The benefit of having Agreement States conform their regulations would be the establishment of a relatively uniform¹⁰ set of both groundwater protection and radiation health and safety requirements for ISR facilities nationwide.

In light of the EPA's withdrawal of its January 2017 proposed rule, the NRC is now conducting an assessment of the requirements in 10 CFR part 40 appendix A pertaining to the licensing of ISRs and is requesting input from members of the public about the topics discussed in the "Request for Comments" section. The information received from this request will be factored into the decision whether to continue this rulemaking.

IV. Request for Comments

The NRC welcomes general comments and seeks comments in response to the numbered items in this section. In responding to these numbered items, please provide your rationale or justification for your position. In addition, please provide a discussion of any factors that you considered in providing your opinion and any recommendations to assist the NRC in improving its regulatory process. The factors that the NRC must consider in determining whether to proceed with this rulemaking include technical feasibility, a cost-benefit analysis, and consistency and clarity of applicable regulations for the adequate protection of the health and safety and the environment.

1. If the NRC were to proceed with its ISR rulemaking that has been held in abeyance since 2010, the NRC would amend its current uranium milling regulations in

¹⁰ Based upon the compatibility category (see *id.* at 48538-39) that the NRC assigns to each new or amended regulation, Agreement States should have a substantial degree of flexibility in promulgating their conforming regulations. *Id.* at 48537 ("With the exception of those compatibility areas where programs should be essentially identical, Agreement State radiation control programs have flexibility in program implementation and administration to accommodate individual State preferences, State legislative direction, and local needs and conditions.").

appendix A to 10 CFR part 40 to add ISR-specific requirements. Should the NRC proceed with this rulemaking?

2. Please identify any issues that should be addressed to protect groundwater at ISR facilities, in either this rulemaking or through the development of guidance documents.

3. Please identify any issues that should be addressed to enhance public or occupational safety at ISR facilities, in either this rulemaking or through the development of guidance documents.

4. Please identify any issues that should be addressed to establish a relatively uniform set of requirements for ISR facilities nationwide (both in Agreement States and in non-Agreement States).

VI. Availability of Documents

The documents identified in the following table are available to interested persons through one or more of the following methods, as indicated.

DOCUMENT	ADAMS ACCESSION NO./ FEDERAL REGISTER CITATION
COMJSM-06-0001, "Regulation of Groundwater Protection at In Situ Leach Uranium Extraction Facilities," dated January 17, 2006.	ML060830041
Staff Requirements Memorandum-COMJSM-06-0001, "Regulation of Groundwater Protection at In Situ Leach Uranium Extraction Facilities," dated March 23, 2006.	ML060820503
"40 CFR Part 192, Health and Environmental Protection Standards for Uranium and Thorium Mill Tailings; Proposed Rule," January 19, 2017.	82 FR 7400
"40 CFR Part 192, Health and Environmental Protection Standards for Uranium and Thorium Mill Tailings; Proposed Rule; Withdrawal," October 30, 2018.	83 FR 54543
NUREG-1569, "Standard Review Plan for In Situ Leach Uranium Extraction License Applications: Final Report," June 2003.	ML032310005
"NRC Staff's Comments on EPA Proposed Rulemaking for 40 CFR Part 192 Rule, 82 FR 7400," July 17, 2017.	ML17173A638
"40 CFR Part 192, Environmental Standards for Uranium and Thorium Mill Tailings at Licensed Commercial	48 FR 45926

Processing Sites; Final Rule,” October 7, 1983.	
“40 CFR Part 192, Environmental Standards for Uranium and Thorium Mill Tailings at Licensed Commercial Processing Sites; Final Rule,” November 15, 1993.	58 FR 60340
“Uranium Mill Tailings Regulations; Conforming NRC Requirements to EPA Standards; Final Rule,” October 16, 1985.	50 FR 41852
“40 CFR Part 192, Health and Environmental Protection Standards for Uranium and Thorium Mill Tailings; Proposed Rule,” January 26, 2015.	80 FR 4156

Throughout the development of this assessment, the NRC may post related documents, including public comments, on the Federal rulemaking Web site at <http://www.regulations.gov> under Docket ID **NRC-2008-0421**. The Federal rulemaking Web site allows you to receive alerts when changes or additions occur in a docket folder. To subscribe: 1) Navigate to the docket folder (**NRC-2008-0421**); 2) click the “Sign up for E-mail Alerts” link; and 3) enter your e-mail address and select how frequently you would like to receive e-mails (daily, weekly, or monthly).

Dated at Rockville, Maryland, this 28th day of January, 2019.

For the Nuclear Regulatory Commission.

Theresa V. Clark, Deputy Director,
Division of Rulemaking,
Office of Nuclear Material Safety and Safeguards.

[FR Doc. 2019-00435 Filed: 1/30/2019 8:45 am; Publication Date: 1/31/2019]